

REVISED CLAIMS
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original Claims 1-29 revised]

1. Electronic spectacles, especially night-vision spectacles (10),
comprising
 - an electronic camera (26) integrated into the spectacles as the primary recording means for the user of the spectacles, the camera being provided with an objective lens and a CCD sensor;
 - an image-processing unit (48), which is connected downline from the camera (26) and which electronically processes the image recorded by the camera (26) and sends an output signal to display means (28, 39), one of which is assigned to each eye, for reproduction of the image; and
 - an eyepiece lens (32, 34), one of which is connected downline from each display means (28, 30),

characterized in that
the camera (26), the display means (28, 30), and the eyepiece lens (32, 34) are designed to work together in such a way that the dimensions of the displayed image which the user detects during use correspond to the real relationships which the user would see in a direct view without restriction.

2. Electronic spectacles according to Claim 1, characterized in that, when the user's eyes are in a certain base position, namely, a position corresponding to a straight-ahead view, the center axis of the display means (28, 30), the optical axis of the eyepiece lens (32, 34), and the associated axis of the user's eye are aligned concentrically with each other.

3. Electronic spectacles according to Claim 1 or Claim 2, characterized in that, to guarantee that the user will see a sharp image, the eyepiece lens (32, 34) of one display means (28, 30) is designed to be adjustable along the optical axis relative to that display means (28, 30) and in particular to be adjustable independently of the eyepiece lens (32, 34) of the other display means (28, 30).

4. Electronic spectacles according to one of the preceding claims, characterized in that each display means (28, 30) is provided with two cameras (26) and two image-processing units (48), the processing steps of which are synchronized with each other.

5. Electronic spectacles according to Claim 4, characterized in that the optical axes of the camera (26) are concentric to the ocular axes of the user in the base position.

6. Electronic spectacles according to one of the preceding claims, characterized in that the display means (28, 30) are mounted in a fixed carrier (24) and are supported so that they can shift laterally in the carrier (24) with respect to the orientation of the ocular axes, where the carrier (24) is fixed in place in the spectacle frame (12).

7. Electronic spectacles according to Claim 6, characterized in that the objective lens and the image-processing unit (48) are mounted in the carrier (24) in such a way that the fixed carrier (24) ensures that all of the parts mounted on the carrier (24) are in a predetermined relationship to each other.

8. Electronic spectacles according to one of the preceding claims, characterized in that the camera (26) and the image-processing unit (48) are

designed in such a way that the image which the user can detect during use is displayed in real time.

9. Electronic spectacles according to one of the preceding claims, characterized in that the camera (26) has a CCD sensor for the night-vision range with a sensitivity for wavelengths in the range of 500-1200 nm.

10. Electronic spectacles according to Claim 8 or Claim 9, characterized in that the camera (26) is designed for available light levels of less than 0.001 lux, especially for a level of 0.0002 lux, without the need for additional lighting.

11. Electronic spectacles according to one of the preceding claims, characterized in that the CCD sensor has an image resolution of at least 790 x 590.

12. Electronic spectacles according to one of the preceding claims, characterized in that the display means (28, 30) is designed for black-and-white images, especially for the display of 256 shades of gray.

13. Electronic spectacles according to one of the preceding claims, characterized in that the image-processing unit has a digitized preamp stage, which removes noise and interference, especially noise in the near-infrared range, i.e., at wavelengths of 650-1200 nm, from the signal coming from the camera (26).

14. Electronic spectacles according to Claim 13, characterized in that the preamp stage is followed by a digital/analog converter, so that the signal can then be subjected to further processing as an analog signal at the standard level of 1 V peak-to-peak (= PAL level).

15. Electronic spectacles according to one of the preceding claims, characterized in that the image-processing unit (48) has two series-connected analog amplifier stages and a control voltage circuit, which calibrates the amplifier stages to zero each time an image pixel is read out – on a line-by-line basis, for example – from the CCD sensor of the camera (26) to guarantee clean signal processing and readout, noise also being suppressed.

16. Electronic spectacles according to Claim 15, characterized in that the amplifier stages provide a signal amplification of more than 25 dB, especially of 52 dB, versus the standard level.

17. Electronic spectacles according to Claim 15 or Claim 16, characterized in that the amplifier stages have an external circuit, which, with respect to its design and scaling, is optimized for the amplification and transmission of signals containing image data in the black/white range.

18. Electronic spectacles according to one of Claims 15-17, characterized in that the amplifier stages are provided with a closed-loop controller for the range from 5 to 52 dB, which modulates the amplifiers during rapid changes in brightness in such a way that the image is not noticeably overexposed, where in particular the controller is designed to be activated manually.

19. Electronic spectacles according to one of Claims 15-18, characterized in that the amplifier stages are provided with a manually actuated open-loop controller, which the user can use to adjust the sensitivity of the amplifiers and thus adapt the system to the prevailing lighting conditions and/or to the specific purpose.

20. Electronic spectacles according to one of Claims 15-19, characterized in that the amplifier stages have a "sample-and-hold" circuit across a field-effect transistor to clamp the signal, which are time-controlled as a function of the arriving signal to achieve high sensitivity and to ensure that the amplifier stages work in harmony with each other.

21. Electronic spectacles according to one of Claims 14-20, characterized in that, to improve the quality of the image, at least two active signal filters in the form of bandpass filters (54) are connected downline from the digital/analog converter, which filters at least suppress and possibly even eliminate image noise and the false-color components.

22. Electronic spectacles according to Claim 21, characterized in that a signal buffer stage (56) with an amplification function, especially by more than two versus the standard level, is connected downline from the active signal filters (54), so that losses from the preceding signal processing and signal transmission steps are compensated and equalized.

23. Electronic spectacles according to one of the preceding claims, characterized in that a bandpass filter (58) and a signal splitter (66) for impedance matching is connected upline of the display means to guarantee loss-free matching to the downline electronic display circuits.

24. Electronic spectacles according to one of the preceding claims, characterized in that the signal splitter (60) cooperates with a signal processing function, which makes it possible for the images shown in the display means to be in phase and synchronized with each other.

25. Electronic spectacles according to one of the preceding claims, characterized in that the display means (28, 30) is formed by an AMLCD or FLLCD screen.

26. Electronic spectacles according to one of the preceding claims, characterized by a connection to a voltage source, especially to a battery (62).

27. Electronic spectacles according to Claim 26, characterized in that the battery (62) is accommodated in a battery housing, preferably separate, which is designed to be fastened to the user's body.

28. Electronic spectacles according to one of the preceding claims, characterized in that the display means (28, 30) have on-screen displays for additional information pertaining to the reproduced image.

29. Electronic spectacles according to one of the preceding claims, characterized in that a transmission and/or reception interface (64, 66, 68) is provided.